

Claims

1. Method for the production of molded bodies (1) out of thermoplastic material with or without fiber reinforcement in a one-step production process, characterised in that
 - a tool is utilized with a lower and an upper shell mold (10a, 10b), which form a mold cavity (12) with surfaces defined on both sides (11a, 11b),
 - which shell molds are designed as thin-walled and metallic,
 - with a centering portion (15a, 15b) of both the shell molds,
 - with a displacement compensating, air-tight edge seal (16) between the two shell molds
 - and with tempering means (13) for the controllable heating and cooling on both shell molds (10a, 10b),
 - wherein thermoplastic material (2) with or without reinforcing fibers (3) is inserted into a shell mold in a locally defined manner,
 - thereupon the shell molds are closed, subsequently evacuated (p_1) and in doing so pressed together with a reduction (ds_1) of the distance between the shell molds,
 - then the shell molds are heated up with the tempering means to a temperature above the melting point (T_m) of the thermoplastic material (2)
 - and held at a temperature (T_s) for the consolidation and flowing of the thermoplastic material under pressure (dp) with a further pressing together of the shell molds (ds_2) up to the contour filling flowing out,
 - and subsequently cooled down under pressure in a defined manner up to the complete solidification of the inserted material
 - and thereupon the shell molds are opened and the formed molded body (1) is removed.
2. Method according to claim 1, characterised in that for the consolidation and flowing out in addition an external pressure (p_2) is applied to the shell molds.

3. Method according to claim 2, characterised in that the external pressure (p2) is applied in a pressure chamber (35) by means of compressed air.
4. Method according to claim 1, characterised in that the shell molds at the edge of the mold cavity comprise a shaped retention zone (17) for the thermoplastic material.
5. Method according to claim 1, characterised in that on the edge of the shell molds vacuum channels (18) are conducted all around.
6. Method according to claim 1, characterised in that with the shell molds geometrical shapings (42) such as ribs (43), holes (44), break-outs and differing wall thicknesses (45) are produced.
7. Method according to claim 1, characterised in that the shell molds are designed as two parts and as separatable with a fixed edge part (10.1) and a mold part (10.2) forming the mold cavity (12).
8. Method according to claim 1, characterised in that the shell molds are composed of differing zones (10.5, 10.6).
9. Method according to claim 1, characterised in that the metallic shell molds (10a, 10b) consist of galvanic layers, in preference of nickel Ni and copper Cu.
10. Method according to claim 1, characterised in that electrical tempering means are attached to the shell molds in the form of insulated electric heating wires (21).
11. Method according to claim 1, characterised in that as tempering means a liquid medium (23) is utilized as cooling means or as heating means and as cooling

means, which circulates in channels (24), which channels are attached to the shell molds (10a, 10b).

12. Method according to claim 1, characterised in that the tempering means (13) are directly integrated into the shell molds (10).
13. Method according to claim 1, characterised in that on the shell molds a locally differing tempering (Q1, Q2, 51) is produced.
14. Method according to claim 1, characterised in that the tempering during the cooling down does not take place in a linear manner, with a slower transition through certain temperature zones (Tk).
15. Method according to claim 1, characterised in that locally differing materials with differing characteristics and shapes are inserted into the shell molds in defined positions.
16. Method according to claim 1, characterised in that additional surface layers (29) are inserted into the shell molds.
17. Method according to claim 1, characterised in that on the surfaces or in certain zones soft, elastic materials (26) are inserted in a locally defined manner.
18. Method according to claim 1, characterised in that inserts (28) are inserted into the shell molds in a positioned manner, which are integrated into the molded body or else are removed again following the production.
19. Method according to claim 1, characterised in that hollow bodies or hollow spaces (46) are formed.

20. Method according to claim 1, characterised in that sealed gas cushions (41) with a defined gas content are inserted into the shell molds.

21. Installation (30) for the production of molded bodies out of thermoplastic material with or without fiber reinforcement in a one-step production process, characterised by
 - a tool with a lower and an upper shell mold (10a, 10b), which form a mold cavity (12) with defined surfaces on both sides (11a, 11b),
 - which shell molds are designed as thin-walled and metallic,
 - with a centering portion (15a, 15b) of the two shell molds,
 - with a displacement compensating, air-tight edge seal (16) between the two shell molds,
 - with tempering means (13) for the controllable heating and cooling on both mold shells (10a, 10b)
 - and with a vacuum device (31) and a control system (34),
 - wherein thermoplastic material (2) with or without reinforcing fibers (3) is able to be inserted into a mold shell in a locally defined manner,
 - the shell molds are closed, subsequently evacuated with the vacuum device (p1) and in doing so pressed together with a reduction (ds1) of the distance between the shell molds,
 - thereupon the shell molds are heated-up with the tempering means to a temperature above the melting point (T_m) of the thermoplastic material (2)
 - and maintained at a temperature (T_s) for the consolidation and flowing out of the thermoplastic material under pressure (dp) with a further pressing together of the shell molds (ds2) up to the contour-filling flowing out,
 - and subsequently cooled down under pressure in a defined manner with the tempering means up to the complete solidification of the inserted material.

22. Installation according to claim 21, characterised by a compressed air device (32), by means of which an additional external pressure (p2) is applied to the shell molds with compressed air.

23. Installation according to claim 21, characterised by two arched half shells (36a, 36b) made out of endless fiber-reinforced plastic material with a locking device (37), which form a pressure chamber (35).
24. Installation according to claim 21, characterised by an assigned confectioning station (38) for the cutting to size and putting together of a pack of material (27), a handling robot (39) for the positioned insertion of material and a process control system (34) for the controlling of the tempering, pressure and materials' movements.
25. Molded body made out of thermoplastic material, manufactured according to the method of claim 1, characterised in that shaped pore-free visible surfaces (9a, 9b) defined on both sides are produced.
26. Molded body according to claim 25, characterised by a multi-layered structure (4) or by locally differing material compositions.